the opposite. You are given that a is not b, and you wish to prove that c is not d. It is not, because, if it is, then a is b; but a is not b, therefore c is not d.

Second. By a similar proof, if the opposite be true, the converse is true.

For example, from the theorem [compare the proof in Wentworth's Revised Geometry, p. 70, Ex. 55]: If two angles of a triangle are not equal, their bisectors are not equal, one may conclude: If the bisectors of two angles of a triangle are equal, the triangle is isosceles. The proof of the first theorem is, indeed, a proof of the second.

DEPARTMENTS.

SOLUTIONS OF PROBLEMS.

GEOMETRY.

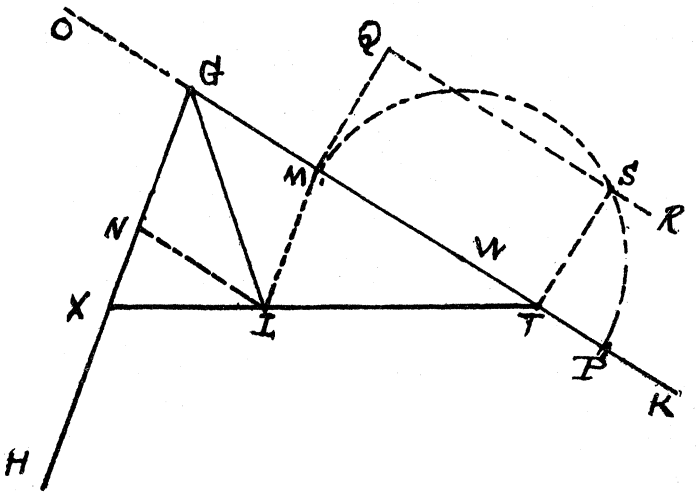
203. Proposed by W. J. GREENSTREET, A. M., Editor of The Mathematical Gazette, Stroud; England.

Show that two parabolae can always be drawn through the vertices of a triangle to touch its circumcircle at a vertex, and that the axes of these pairs of curves are orthogonal. Show that any triangle may be circumscribed by a conic so that the tangents at each vertex is parallel to the opposite side.

No solution has been received.

204. Proposed by ELMER SCHUYLER, B. Sc., Professor of German and Mathematics, Boys' High School, Reading, Pa.

Construct a triangle, having given an angle, the length of its bisector, and the sum of the including sides. (Phillips and Fisher).



Solution by G. I. HOPKINS, J. SCHEFFER, and G. B. M. ZERR.

Let AB be the sum of the two sides, CD the bisector, and F the given angle. Make $\angle HGK=\angle F$ and bisector $GL=CD$. Draw LM parallel to HG and NL parallel to GK. Extend GK making $GO=NG$. Make $OP=AB$, and on MP draw the semicircle MSP. Draw the perpendicular $MQ=ML$, also QR parallel to MP and ST perpendicular to MP. Through L draw TX, then TGX is the required triangle; for $TS^2=MT.PT=QM^2=ML^2$. From similar triangles XNL and LMT, $XN:LM::NL:MT$. Since $MLNG$ is a rhombus $LM=NL$. $\therefore XN.MT=ML^2$. $\therefore MT.TP=MT.XN$, whence $NX=TP$. $\therefore GX+GP=OP=AB$.

CALCULUS.

168. Proposed by F. P. MATZ, Sc. D., Ph. D., Professor of Mathematics and Astronomy in Defiance College, Defiance, O.

The tangent of what Cartesian curve makes an x-intercept always m times as long as the corresponding y-intercept.

Solution by J. SCHEFFER.

Let the equation of the tangent be $y-y'=\frac{dy'}{dx'}(x-x')$. Consequently the x-intercept $=x'-y'\frac{dx'}{dy'}$, and the y-intercept$=y'-x'\frac{dy'}{dx'}$; therefore, omitting the accents, by the condition imposed upon the problem

$$-\frac{y}{p}+x=m(y-px);\quad \left(p=\frac{dy}{dx}\right),$$

whence $mxp^2-(my-x)p-y=0$; or, arranged differently, $(px-y)(mp+1)=0$, whence $px-y=0$ and $mp+1=0$. From the former of these two equations we get $y=ax$; and from the second $my+x=b$, where a and b are arbitrary constants. Both equations represent straight lines, the first one of which passes through the origin.

MECHANICS.

159. Proposed by J. E. SANDERS, Hackney, Ohio.

Required the time for a tree, considered as a material line of uniform density, length $a=100$ feet, to fall; the tree being inclined $\phi=1'$ from perpendicular.

Solution by the PROPOSER.

From Mechanics we find that

$$\frac{\sqrt{(2gh)}t}{l}=\int\frac{d\theta}{\sqrt{[1-(2l/h)\sin^2\frac{1}{2}\theta]}}\ldots\ldots(1),$$